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Testimony Regarding the Substitute House Bill 4493
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The substitute for House Bill 4493 is designed to reduce injuries and save Michigan teenagers' lives. Motor vehicle crashes are the leading cause of death and one of the top two causes of non-fatal injury for 15- to 19-year-olds in Michigan and the US [1]. Teenage drivers have the highest rate of fatal and non-fatal crashes of any age group of drivers (see Figures 1 and 2 [Based on Year 2000 data]) [2].

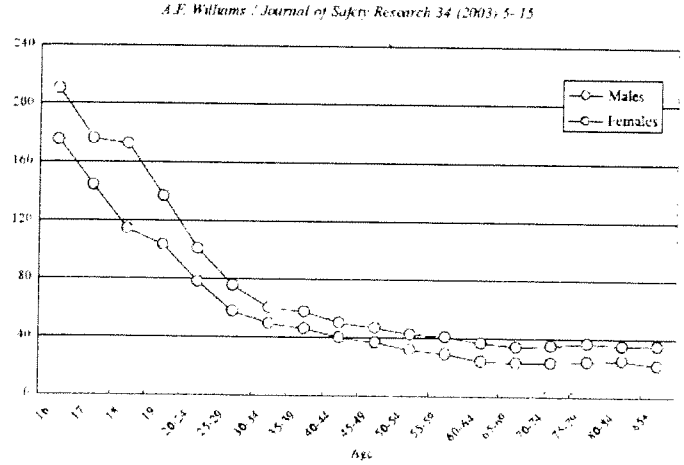


Figure 1. Driver crash involvements per 1000 licensed drivers by age

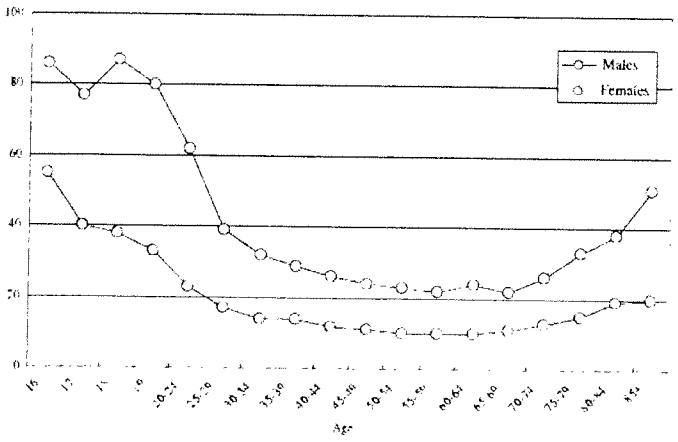


Figure 2. Driver fatal crash involvements per 1000 licensed drivers by age

Teenage drivers are not the only victims when they are involved in crashes. Their passengers and the occupants of other vehicles are also at risk [3]. In the five years from 2004-2008, 886 people died on Michigan roadways in crashes involving a teenage driver (see Figure 3). Five hundred eleven, or 58% of those fatalities were 15 to 19 years old, and 742, or 84% of the fatalities were under age 50. This loss of life represents a considerable loss of Michigan residents who are at their peak lifetime productivity, or who have yet to reach their maximum level of productivity. It also represents untimely deaths of young children and adolescents, young adults, brothers, sisters, sons, daughters, and fathers and mothers with families still at home.

Fatalities are not the only negative consequence of crashes involving teenage drivers. From 2004-2008, approximately 13,306 have been non-fatally injured, with over 4,000 receiving incapacitating injuries in crashes involving a teenage driver. Many of these injuries result in long-term physical and/or mental impairment, and have significant impacts on the quality of these people's lives.

The risk of being in a motor vehicle crash is high for all teenage drivers. It is not only those teenagers who purposefully take risks, break traffic laws, and drive carelessly who are at high risk, nor is this risk limited to children of uninvolved or negligent parents. All teenage drivers have a high risk of motor vehicle crash because they all lack driving experience and have not fully developed essential driving skills.

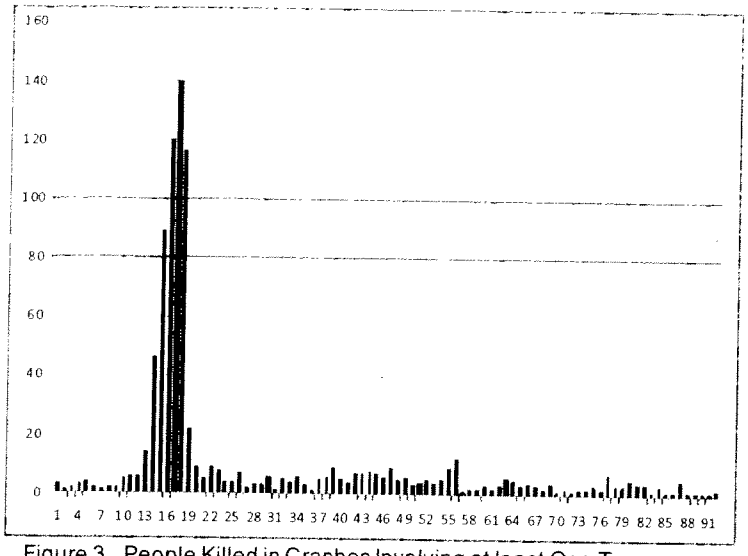


Figure 3. People Killed in Crashes Involving at least One Teenage Driver on Michigan Roadways by Year of Age

Even under the best conditions, teenage drivers are likely to crash. Overall, teenage drivers in Michigan are at considerably higher risk of being involved in a crash than are adult drivers between the ages of 45 and 65 years, and they are approximately five times more likely to be in a crash in which there are fatal and/or non-fatal injuries [4,5]. Crashes are not accidents. They are discrete events that would not occur if contributing risk factors were avoided or the proper preventive actions taken. For this reason, it is very important to understand that three factors further elevate teenage drivers' generally high likelihood of being in a crash: teenage passengers, nighttime driving, and cell phone use (either speaking or texting) while driving.

Teenage passengers dramatically increase the likelihood that a teenage driver will be involved in a crash (see Figure 4). Compared to driving alone, a 16-year-old driver with one teenage passenger is 1.4 times more likely to be fatally injured in a crash. With two passengers they are nearly two times more likely, and three or more passengers increases 16-year-old drivers' risk of being fatally injured in a crash by a factor of nearly three. The level of risk associated with driving with teenage passengers is only slightly less for 17-year-old drivers. In comparison, the risk of adult drivers being killed in a crash is unchanged by number of teenage passengers present [6,7].

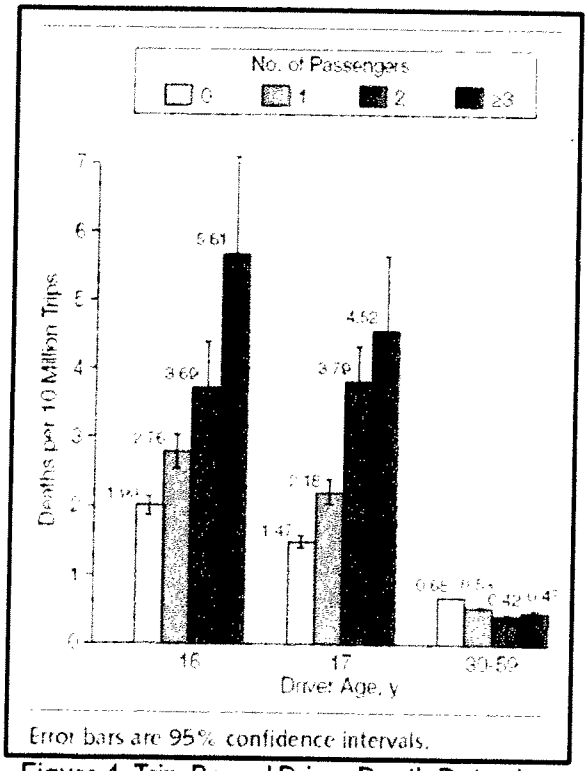


Figure 4. Trip-Based Driver Death Rates by Driver Age and Number of Passengers

Chen, Baker, Braver, Li
JAMA, March22/29, 2000 – Vol 283, No 12

Teenagers also have an elevated risk of crashing while driving to and from school. Numbers of fatal crashes peak during the times when teens are driving to and returning from school (see Figure 5). This daily pattern of fatal crash risk is likely in part due to teenagers' practice of carpooling to school with friends, neighbors, and siblings.

Teenage drivers' risk of crashing is also elevated by driving at night [6-9]. Compared to driving during the daytime (5:00am to 9:59pm) the fatal crash risk while driving at night (10:00pm to 4:49am) is 6.5 times greater for teenage males and nearly three times greater for teenage females [7]. Combining driving with a teenage passenger and driving at night further inflates the risk that a teenage driver will be involved in a fatal crash. Compared to driving alone during the day, teenagers driving at night with a teenage passenger have over 11 times greater risk of being in a fatal crash [7].

Research on driver distraction clearly demonstrates its impact on crash risk. Driving is a complex task, and even adult drivers' risk of crash is increased when they are distracted [10-12]. Cell phones, whether used for talking or texting, are just one source of driver distraction [13]. However, their ubiquity in modern culture and their extreme popularity among teenagers make them a worrisome source of driver distraction and error.

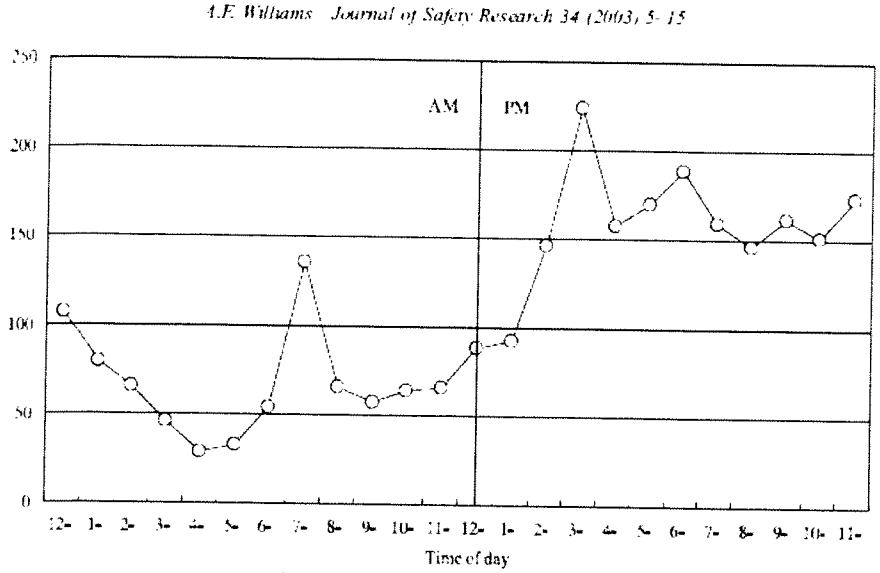


Figure 5. Sixteen- to 17-year-old drivers in fatal crashes, hour by hour, 1995

Research indicates that the degree of driving impairment caused by cell phone distraction is considerable. Research conducted here in the US suggests that the decrement in driving performance resulting from cell phone distraction is equivalent in severity to driving with a blood alcohol concentration of .08 mg/dL , which is the per se limit in all 50 US states. Other research comparing talking on a cell phone while driving to conversing with a passenger demonstrated that both hand-held and hands-free cell phone use resulted in an equivalent reduction in driving performance and both impacted driving performance more seriously than conversing with a passenger. The reason for the difference between cell phone and in-person conversation is that passengers share awareness of the traffic situation and conversations with passengers often involve the subject of surrounding traffic. Also, driving conditions directly influence the complexity of conversation such that a conversation with a passenger decreases in complexity as driving demands increase, thereby mitigating potential negative effects of the conversation on driving performance [14].

Graduated driver licensing (GDL) has contributed to significant decreases in teen crash rates. Studies have consistently demonstrated the effectiveness of GDL programs in reducing crash rates among teenage drivers from 20% to 40%, with reductions of up to 45% in fatal injury crashes {{[15] 427 Shope,J.T. 2003; 775 Shope,J.T. 2004; 1007 Ulmer,R.G. 2000; 1008 Nissley, JZ 2001; }}. Additionally, research indicates that more comprehensive GDL programs have a greater effect in reducing crashes among teenage drivers {{1011 Chen, L.H. 2006; 840 Morrisey,M.A. 2006; }}. As states have enhanced their GDL programs by strengthening or adding restrictions, evaluations have demonstrated an additional reduction in the crash involvement of teenage drivers in those states. Nighttime restrictions that start earlier, passenger restrictions that allow fewer passengers, and restrictions that span more months have been shown to add to GDL's effect in reducing crashes among teenage drivers.

It is within the power of the Michigan Legislature to increase the safety of Michigan teenagers. Based on the evidence from research, I am confident that by implementing the restrictions indicated in the substitute for House Bill 4493 on driving with passengers, nighttime driving, and cell phone usage by teenage drivers, crashes involving teenage drivers in Michigan will be reduced. Such legislation will also be received positively by the majority of parents in Michigan. At the University of Michigan Transportation Research Institute, using funds provided by the Centers for Disease Control and Prevention, we completed a nationally representative survey of parents with teenage children who were old enough to receive a driver license in their respective states. We found considerable support for enhancements to GDL among Michigan respondents to the survey. Regarding passenger restrictions, 96% of Michigan parents surveyed indicated that they would support a passenger restriction for teenage drivers (See Figure 6), and were in favor of such a restriction lasting 16 months. Similarly, 95% of Michigan parents responding to the survey said they would support a nighttime driving restriction (See Figure 7), and indicated that such a restriction should begin at 10pm and last until 6:00 am. All the Michigan parents surveyed were supportive of a ban on cell phone use for texting or talking by teenage drivers under age 18 (See Figure 8).

Figure 6. Percentage of Michigan Parents Supporting a Passenger Restriction

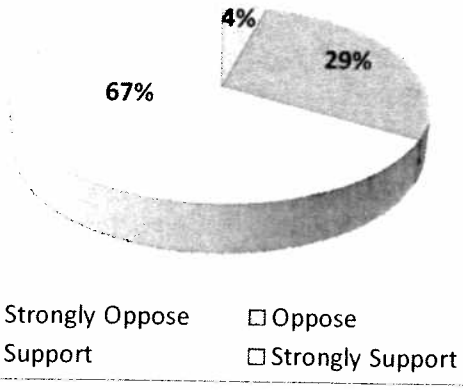


Figure 7. Percentage of Michigan Parents Supporting a Nighttime Restriction

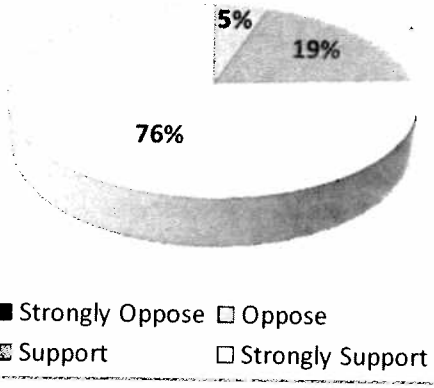
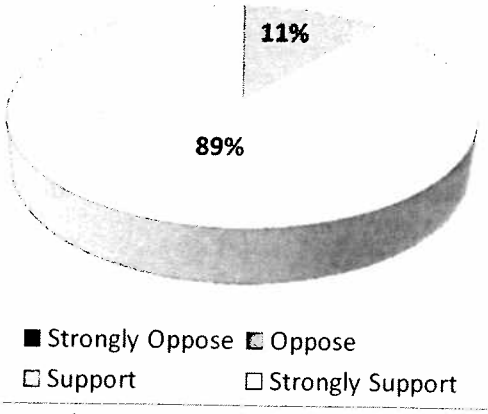


Figure 8. Percentage of Michigan Parents Supporting a Cell Phone Restriction



As part of the same study, we conducted focus group interviews with Michigan parents of children who were between the ages of 16 and 17 years. These parents were overwhelmingly supportive of Graduated Driver Licensing (GDL) and in favor of additional restrictions on passengers, nighttime driving and cell phone use being added to Michigan's current GDL law. They said that it gave them the support of state law and made it easier to supervise their children's driving. Similar attitudes were found in focus group interviews with parents from Indiana and Ohio.

There is a common perception among policymakers that rural constituents will oppose restrictions on teenagers driving with young passengers and/or at night. As Michigan has a large rural constituency, it is important to note that in other Midwestern states, namely Iowa and Kansas, 80% of rural, suburban, and urban parents were in favor of restrictions for their teenage children who were licensed to drive. The safety of their children is of paramount importance for parents, no matter where they live. Parents recognize the effectiveness of GDL restrictions in protecting their teenage children from a crash and the potential of serious injury.

Finally, it should also be kept in mind that restrictions on the number of passengers and nighttime driving do not impact the majority of driving trips taken by teenage drivers in Michigan. In 2006 the Michigan Department of Transportation conducted a representative survey of Michigan residents, including teens, called "Michigan Travel Counts." The results indicated that the majority of driving trips taken by teenagers occurred on their own. Only 31% of all driving trips taken by teenagers included any passengers and only 22% involved more than one passenger. Even in these cases, most of the time (57%), the passenger was a family member. In addition, only three percent of all trips were taken between the hours of 10:00pm and 5:00am.

What these results imply is that a passenger restriction and an extended nighttime restriction for drivers under age 18 will affect a minority of the trips taken by teens; however, the trips that such restrictions would eliminate are the deadliest trips teenagers make. Where legislation such as that proposed in substitute House Bill 4493 has been passed, lives have been saved, injuries avoided, and greater health and well-being of teenagers has been achieved. Whatever adjustments teenage drivers or parents have to make as a result of this legislation will be a small price to pay in light of the significant gains in the safety of Michigan's most vulnerable drivers.

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HB 4493 Fact Sheet

Motor vehicle crashes are the number one killer of persons 1-35 years of age. For those between the ages of 15 and 20, crashes are the leading cause of death, surpassing the next three causes of death (disease, homicide and suicide) combined! Over the past 5 years, nearly 1100 Michigan citizens have died in auto crashes involving a teen driver. Nationally, since 1999, more than 84,400 people have been killed in crashes involving teen drivers.

Michigan has a graduated drivers licensing system that provides levels of licensure based on training and experience but does not address the distractions that are the greatest contributor to motor vehicle crashes for novice drivers. Reducing distractions has been proven effective in reducing collisions and their resulting injuries and deaths. In assessing our current Michigan GDL laws Michigan received only a "FAIR" rating from the Insurance Institute for Highway Safety (IISH).

PASSENGER RESTRICTIONS

Other non-family member, youthful passengers present a major distraction to novice drivers. HB 4493 restricts passengers to one non-family member passenger under 21 years old during the GDL level 2 period when drivers are first autonomous from their parents/guardians.

CELL PHONE RESTRICTION

Youthful drivers lack experience behind the wheel. Cell phones and driving inexperience are a deadly combination. HB 4493 prohibits the use of a cell phone by a GDL level 2 driver except in emergency situations.

NIGHT DRIVING

A large number of motor vehicle crashes occur during the evening hours. Night time restrictions have been proven to save lives. Michigan currently has GDL level 2 driving restrictions between the hours of 12 a.m. and 5 a.m. HB 4493 would move the nighttime driving restriction for GDL level 2 drivers to 10 p.m.

Organizations supporting HB 4493

National Safety Council, State Farm Insurance, AAA, Allstate, Farmers Insurance, Michigan Chapter of American Academy of Pediatricians, Michigan State Police, Ford Motor Company, Michigan Office of Highway and Safety Planning

Teen driving risks in high gear in summer

Safety programs aimed at deterring behavior linked to more fatalities for ages 15-20

By Larry Copeland
USA TODAY

As summer officially starts today, teenage drivers across the USA are poised to enjoy school-free days, summer jobs and youthful frolics.

Their parents might be less eager. Automobile crashes are the leading cause of death for teenagers in the USA, and the period between Memorial Day and Labor Day is the deadliest for drivers ages 15-20, according to the National Highway Traffic Safety Administration (NHTSA).

Traffic safety experts attribute the higher fatality rate to youths having more free time under less parental supervision, more opportunities to drive at night, when road risks are higher, and relaxed curfews.

"For many kids, every day in the summer is a weekend day," says Justin McNaull, state relations director for auto club AAA. "There's less parental supervision in the daytime because Mom and Dad are at work. In the evening, curfews get slid back, and they spend more time on purposeless trips, which are more dangerous. Driving with your buddies to find a party at 10 p.m. is very different from driving to school at 7 a.m. on a weekday. There's a very different environment both outside and inside the vehicle."

Over the course of a year, the hours from 10 p.m. to midnight on Fridays and Saturdays are four of the deadliest hours of the week for teens.

"When you get to summer, because there's no school the next day, a Tuesday night is no different from a Friday night for many teens," McNaull says.

To counter this reality, states and highway safety officials try to reach young drivers before the end of the school year and remind them — and their parents — to exercise extreme caution while on summer break.

▸ In North Carolina, where more than 680 teens have been killed in the past four years in wrecks investigated by state troopers, the North Carolina Highway Patrol conducts a week-long program to encourage safe driving by teens. Operation Drive to Live 2010 emphasizes education and enforcement. State troopers visit high schools to talk with students and crack down on young drivers breaking the law.

"Hopefully, it will remind them of the risks in dangerous driving over the summer," says Maj. Everett Clendenin of the highway patrol.

▸ The Washington Regional Alcohol Program, a nonprofit group battling drunken driving and underage drinking in Washington, D.C., Maryland and Virginia, warns parents of the hazards of summer driving through media and parent-teacher organizations. "There are nearly 50% more drunk-driving deaths involving teens during the summer months than during any other time of the year," President Kurt Erickson says.

▸ The Texas Department of Transportation, prompted by statistics showing that half of all teens in fatal crashes in the USA in 2007 were not wearing seat belts, last year used an NHTSA grant to launch a "Teen Click It or Ticket" campaign. The agency says the program has helped push seat belt usage for young Texas drivers from 83% to 92%. "Before they left school for summer, when they'll be doing more road trips and more trips at night, we

By Erik S. Lesser for USA TODAY

Not a game: Students at West Forsyth High School in Cumming, Ga., practice their road skills using simulators during a driver education class last fall.

Tips on avoiding wrecks

▸ **Risk-taking.** A crash can happen to you. And it's not just about you: Crashes affect pedestrians, passengers and other drivers, plus their families. Don't do something you'll regret the rest of your life.

▸ **Unbuckled belts.** Use a safety belt and insist that all of your passengers do so. It reduces by 45% your chances of being hurt or killed in a crash.

▸ **Speeding.** Stick to the speed limit. One-third of teen road fatalities involve speeding.

▸ **Rowdy passengers.** Don't load up your car with friends. Adding one teen passenger to a vehicle increases a 16- or 17-year-old driver's crash risk by about 50%.

▸ **Cellphones.** Save the phone calls, text messaging and other gadgets for after the driving is done.

▸ **Nighttime cruising.** Don't drive late at night. Teen crash rates at night (9 p.m.-6 a.m.) are twice as high as daytime rates.

▸ **DUI.** Stay sober. Of 16- to 17-year-olds killed in crashes, one in six would have been considered legally intoxicated by adult standards.

Source: AAA auto club

▸ During June, the National Safety Council is offering free downloads of "Teen Driver: A Family Guide to Teen Driving Safety." AAA has issued a list of 10 teen driving mistakes and tips on how to avoid them.

The risks for teen drivers are high year-round. In 2008 in the USA, nine youths ages 16-19 died every day from motor vehicle injuries, according to the Centers for Disease Control and Prevention. The Insurance Institute for Highway Safety says that drivers in this age group are four times more likely to crash than older drivers.

The dangers of summer driving for teens stem from "unstructured time and greater access to a motor vehicle," says Erickson, whose organization works year-round with 150 high schools in the Washington, D.C., area. "We're kind of talking about these idle hands."

The two main factors in teen auto crashes are inexperience and immaturity. During the school year, most crashes involving teens are generally caused by inexperience, McNaull says.

"They miscalculate while trying to make a left turn, or they rear-end somebody," he says. In evening crashes, which are more common in the summer, "when young drivers and their friends are driving to fast-food places or looking for a party, that's when you see more of the crashes related to immaturity, wanton risk-taking."

"There's just more exposure for teens during the summertime," McNaull says. "Parents need to be more en-

Pergamon

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THE EFFECT OF TEENAGE PASSENGERS ON THE FATAL CRASH RISK OF TEENAGE DRIVERS

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Abstract—Fatal crash-involved drivers of passenger vehicles were identified in the Fatality Analysis Reporting System for the period 1990 through 1995. Each driver was categorized as being alone in the vehicle at the time of the crash or with one or more passengers. Drivers at fault or responsible for crash occurrence were defined as all drivers involved in a single-vehicle crash, or drivers in multiple-vehicle crashes who were coded in the Fatality Analysis Reporting System as committing one or more driver errors. The results indicated that passenger presence was associated with proportionately more at-fault fatal crashes for drivers aged 24 and younger, were a neutral factor for drivers aged 25–29, and were associated with fewer at-fault involvements for drivers aged 30 and older. Relative risk of fatal crash involvement was particularly high for teenage drivers traveling, day or night, with two or more teenage passengers. Additional research is needed to determine how the added risk associated with teenage passengers riding with teenage drivers can be reduced or eliminated. © 1998 Elsevier Science Ltd. All rights reserved

Keywords—Teenagers, Fatality, Injury, Licensing

INTRODUCTION

In 1990, the last year for which data from the National Personal Transportation Survey are currently available, 16 year-olds had 43 crashes per million miles driven, compared with 30, 15, 10, and 5 crashes for aged 17, 18–19, 20–24, and 25 and older, respectively. For fatal crashes, the 1990 rate of involvement was 17 per million miles driven by 16 year-olds compared with 13, 7, 5 and 3, respectively, for the older age groups (Ulmer et al., 1997). These extremely high crash rates for teenagers in general, and 16 year-olds in particular, have been attributed not only to driver inexperience but also to driver risk taking (see, for example, Mayhew and Simpson, 1990).

Risk taking does not appear to be a general characteristic of teenage driving. Rather, the propensity to take risks seems to be highly related to the driving context. Young drivers will take risks behind the wheel in some driving contexts that they would not take in other contexts. For instance, it has been shown that teenagers can be extremely safe drivers, taking few deliberate risks, when learning to drive with their parents or some other adult (Williams et al., 1997). Similarly, teenagers can be safe when engaged in specific purposeful driving or when they have an extreme motivation to avoid the police. Teenage risky driving seems to be most associated with driving for recreational purposes, such as when out with friends on a Friday night (see, for example, Preusser, 1996).

If teenage risky driving is situational and/or otherwise dependent on the driving context, then it would be of interest to identify which elements of that context contribute to the propensity to take risks. One such element that apparently contributes to risk taking is the presence of other teenage passengers.

Foldvary and Lane (1969) showed that the per mile crash rate for teenagers was higher with, than without, other teenage passengers. Farrow (1987) asked teenagers to describe all of the dangerous driving situations they had participated in within the last six months. The 192 respondents in this study described 662 incidents, of which 85 percent involved the presence of other teenage passengers. Crash- and fatal crash-involved teenagers were more often accompanied by other passengers, typically other teenagers, than were any other age group (Williams and Wells, 1995). Drummond and Triggs (1991), using Australian road survey and crash data, found

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an increase in crashes for inexperienced drivers (typically teenagers) at night with one passenger and a greater increase in crashes at night when carrying two or more passengers.

The objective of the present study is to quantify the relationship between the presence of passengers and the crash risk of passenger vehicle drivers. The focus is on teenage drivers. The database used was the Fatality Analysis Reporting System (FARS) of the National Highway Traffic Safety Administration for the period 1990 through 1995.

METHODS

The question in this study was whether drivers traveling with one or more passengers have a higher, or lower, fatal crash involvement risk than those traveling alone. While crash risk can be stated in a variety of ways, it is typically some form of a ratio in which the numerator is number of crash involvements and the denominator is a measure of exposure (e.g. number of crashes per miles driven). For fatal crashes, the numbers of crash involvements and passengers can be tabulated directly from FARS. However, the measure of exposure is not so easily obtained.

The exposure measure used by Drummond and Triggs (1991) was based on an analysis of roadside survey data collected in Australia during the 1980s. These Australian data showed driver age and number of passengers. Similar roadside information is not available on a national basis for the United States. Therefore, the present study estimated exposure to various passenger and non-passenger driving situations using a technique referred to as indirect or induced exposure.

Induced exposure is based on the concept that any driver on the road may be the victim in a multiple-vehicle crash of some other driver's mistake. These not-at-fault crashes can be used as a surrogate measure of exposure to highway risk. The more often a driver is on the road, the more likely the driver is to be involved, at random, in a not-at-fault crash. The number of at-fault crashes tells us how risky their driving is while they are on the road.

This technique, as proposed by Thorpe in 1964 (summarized by Waller et al., 1973), starts with the assumption that "single-vehicle accidents are caused entirely by attributes of the driver-vehicle combination concerned." Multiple-vehicle crashes are considered the same as single-vehicle when the "driver-vehicle combination [is] the responsible combination." Multiple-vehicle crashes with, "... any particular driver–vehicle combination being innocently involved in a collision accident will be the likelihood of meeting that combination on the road (i.e., will constitute the exposure distribution)."

In effect, at-fault or responsible crash involvement becomes the numerator and not-at-fault or not-responsible involvement in multiple-vehicle crash events becomes the denominator. Crash risk can then be expressed as relative risk calculated in the present study as relative to drivers aged 30–59 (after Clayton et al., 1977).

$$\text{Relative risk} = \frac{T_f A_{nf}}{T_{nf} A_f},$$

where

T = number of crash involvements for the target age driver (e.g. 16-year-old drivers),
A = number of crash involvements for adult drivers aged 30–59 (i.e. the base driver group),
f = at-fault involvements, and
nf = not-at-fault involvements.

The strength of the induced exposure technique is that it requires no assumptions for time of day, road type, vehicle type, type of area, or other variables that might be related to high risk or low risk driving situations. Types or groups of drivers who drive more in high-risk situations should have a proportionately greater opportunity for 'induced' exposure than groups of drivers who drive more in low-risk situations.

Fatal crash-involved drivers of passenger vehicles were identified in FARS for the years 1990–1995. Each involved driver was categorized as being at fault or not at fault in the crash. At fault was defined as either being involved in a single-vehicle crash, or being assigned in FARS one or more driver-level factors of codes 20–59 (i.e. behavioral errors). Passenger vehicles were defined as cars, vans, light trucks, and utility vehicles. Drivers of motorcycles, motor homes, farm equipment, buses, medium trucks, and heavy trucks were excluded. Also excluded were crashes involving a pedestrian or bicyclist. Each driver was categorized as being alone in the vehicle at the time of the crash or as having one or more passengers. Additionally, for teenage drivers, accompanying passengers were categorized as one teenage passenger (and no others), two or more teenage passengers (and no others), or some other passenger combination (i.e. at least one passenger age 12 or younger, or age 20 or older).

RESULTS

Table 1 shows the number of passenger vehicles that were tabulated from FARS for the 1990 through 1995 period. Also shown is the percentage of these vehicles, by driver age, that had passengers. Overall,

Table 1. Percentage of fatal crash-involved drivers traveling with passengers (FARS, 1990–1995)

Driver age	N	Percentage with passengers		
			Time	
		All	Night	Day
16	6586	65	70	62
17	8109	60	65	56
18	9771	56	62	51
19	9766	53	60	47
20–24	43,375	48	52	45
25–29	35,481	42	43	42
30–59	117,467	37	35	37
60–69	18,350	38	35	38
70+	24,149	39	35	39

The 95% confidence interval surrounding the percentages shown ranges from ± <1% to ±2%.

Table 2. Percentage of fatal crash-involved drivers at fault (FARS, 1990–1995)

Driver age	Percentage at fault		
	All	Driver alone	With passenger(s)
16	84	81	86
17	80	76	82
18	80	76	82
19	78	75	81
20–24	75	73	77
25–29	69	70	68
30–59	62	65	56
60–69	62	67	54
70+	77	81	71

The 95% confidence interval surrounding the percentages shown ranges from ± <1% to ±2%.

16-year-old drivers, compared with drivers of other ages, were most likely to have been accompanied by one or more passengers at the time of their fatal crash involvement (65%). The percentages of drivers with passengers involved in fatal crashes then declined with increasing driver age through the 30–59-year-old age group (37%) and then rose slightly for older drivers.

Table 1 also shows the percentage of vehicles with passengers involved in night (8.00 P.M. to 3.59 A.M.) and day (4.00 A.M. to 7.59 P.M.) crashes. For teenage drivers and young drivers up to age 25, passengers were more common in night-time crashes than in those during the day. Forty-one percent of 16-year-old drivers who had passengers had one teenager in the car (and no others), 37% had two or more teenagers (and no others), and the remaining 22% had some other passenger combination. The comparable percentages for other teenagers were 42, 32, and 26 for age 17 drivers; 39, 25, and 37 for age 18 drivers; and 31, 16, and 47 for age 19 drivers. Thus, particularly for 16 and 17 year olds, the most likely passengers were other teenager(s) with no adult present in the vehicle.

Table 2 shows the percentage of drivers who were at fault in the crash by passenger presence. The results indicated that overall, the percentage at fault was highest for 16-year-old crash-involved drivers, declining with age through the 60–69-year-old age group, then increasing again for ages 70 and older. Teenage drivers were less often at fault when the driver was alone, and more often at fault when the driver was with one or more passengers. Passenger presence did not affect the at-fault percentage for drivers in their mid-twenties. For drivers aged 30 and older, the presence of passengers was associated with a lower percentage at fault. That is, the data indicated a cross-over as a function of driver age. Passengers were a negative factor for assignment of fault for teenagers, neutral for drivers in their mid-twenties, and positive for drivers aged 30 and older.

Table 3 shows the percentage of at-fault crashes for teenage drivers as a function of who the passengers were. These results indicated that, for every year of driver age 16 through 19, the presence of two or more teenage passengers (only) was associated with a higher percentage of at-fault crashes than when only one teenage passenger was present, or with a passenger(s) of some other age, or when driving alone.

Table 4 provides an analysis of teenage driver fault by time of day. Both during the day and at night, the at-fault percentages for drivers with teenage passengers were higher than when driving alone, particularly when more than one teenage passenger was present. Moreover, these at-fault percentages were little affected by whether the trip was being made during the day or at night.

Table 5 shows the relative risk of being involved in a fatal crash by driver age and passenger presence. Overall, 16-year-old drivers were 3.28 times more likely to be involved in a fatal crash than drivers aged 30–59. Although relative risk decreased with increasing age, it increased for drivers aged 70 and above. Relative risk was calculated separately for situations in which the driver was alone or was accompanied by passengers. Sixteen-year-old drivers traveling alone were 2.28 times more likely to become involved in a fatal crash than drivers aged 30–59 traveling alone; 4.72 times more likely when traveling with passengers than 30–59-year-old drivers with passengers. Similarly, drivers aged 17, 18, and 19 had a higher crash risk when carrying passengers than when traveling alone. The relative risk in situations in which the teenage driver's passengers were two or more other teenagers (and no others) was even

Table 3. Percentage of teenage fatal crash-involved drivers at fault (FARS, 1990–1995)

	Percentage at fault			
		Driver with passenger(s)		
Driver age	Driver alone	Not teenage only	One teenager only	Two or more teenagers only
16	81	80	84	91
17	76	81	79	87
18	76	80	82	88
19	75	80	78	86

The 95% confidence interval surrounding the percentages shown ranges from $\pm < 1\%$ to $\pm 2\%$.

Table 4. Percentage of teenage fatal crash-involved drivers at fault by time of day and teenage passenger presence

	Daytime			Night-time		
Driver age	Driver alone	One teenage passenger	Two or more teenage passengers	Driver alone	One teenage passenger	Two or more teenage passengers
16	79	84	91	85	85	91
17	75	76	86	78	82	87
18	74	80	85	80	83	89
19	71	77	84	80	79	88

higher—7.86, 5.15, 5.51, and 5.22 for 16-, 17-, 18-, and 19-year-old drivers, respectively.

In the present study, drivers were categorized as being at fault in the crash if they were involved in a single-vehicle event or if they were judged to have committed a driving error in a multiple-vehicle event. An alternative approach, referred to as 'quasi-induced exposure' [see, for example, Stamatiadis and Deacon (1997)], restricts the analysis to multiple-vehicle events only. Recalculating relative risk for young drivers based on multiple-vehicle events only produced results that were equivalent to the calculations based on all crash events. Overall risk, as shown in Table 5, was 3.28, 2.45, 2.47, and 2.19 for drivers aged 16–19, respectively. These same results, limited to multiple-vehicle events only, were 3.67, 2.54, 2.46, and 2.08. Similarly, with passengers, the calculated risk for all crash involvements for drivers aged 16–19, was 4.72, 3.52, 3.66, and 3.23, respectively, versus 4.86, 3.32, 3.29, and 2.81 when the calculations were limited to multiple-vehicle events only.

DISCUSSION

The results of this study indicate that the risk of being involved in a fatal crash is much higher for teenage drivers when passengers are present in the vehicle as compared with driving alone, particularly when the passengers are other teenagers and particularly when more than one teenage passenger is present. Furthermore, the presence of teenage passengers increases the at-fault involvement of teenage drivers in fatal crashes both during the day and at night.

Clearly, the presence of teenage passengers is

Table 5. Relative risk of fatal crash involvement by driver age and passenger presence (FARS, 1990–1995)

	Relative risk					
Driver age	All	95% confidence intervals	Driver alone	95% confidence intervals	With passengers	95% confidence intervals
16	3.28	3.07–3.51	2.28	2.05–2.53	4.72	4.32–5.15
17	2.45	2.32–2.59	1.77	1.63–1.92	3.52	3.26–3.80
18	2.47	2.34–2.59	1.77	1.65–1.90	3.66	3.40–3.93
19	2.19	2.08–2.30	1.61	1.50–1.72	3.23	3.01–3.47
20–24	1.86	1.82–1.91	1.50	1.45–1.55	2.54	2.45–2.64
25–29	1.41	1.38–1.45	1.28	1.24–1.32	1.69	1.62–1.76
30–59*	1.00	—	1.00	—	1.00	—
60–69	1.03	1.00–1.07	1.13	1.08–1.18	0.91	0.87–0.96
70+	2.09	2.02–2.16	2.27	2.17–2.37	1.93	1.84–2.03

*The 30–59 age group is the reference group for relative risk calculations.

associated with driver errors. Passengers can distract young drivers who are still in the process of mastering the complex skill of driving and need to pay full attention to the task. Passengers can also induce risk taking by young drivers. A recent study of night-time fatal crashes in California involving 16-year-old drivers, in which in-depth analyses of police crash reports were supplemented with newspaper accounts (Williams et al., in press), showed many examples of loss of attention and risk-taking in cars with multiple teenage passengers. These included passengers urging drivers to speed or to take corners too quickly, driving at night at high speed without the headlights on, drivers showing off for passengers, physical interference with the driver, drivers looking at and talking to passengers, and so on.

Alcohol may also be a factor. Evaluation of the role of alcohol is difficult because less than half of all 16- and 17-year-old fatal crash-involved drivers were tested for alcohol. However, analysis of these data shows that 17% of the 16-year-old drivers covered in the present study who were traveling alone, and who were tested for alcohol, had a blood alcohol concentration (BAC) of 0.01% or higher. This compares with 24% for 16-year-old drivers who were traveling with two or more teen passengers. The comparable figures for 17 year-olds were 25% at 0.01% BAC or higher when alone versus 34% at 0.01% BAC or higher when with multiple teen passengers. Thus, the increased risk of having additional teenage passengers in the vehicle may be due in part to the higher incidence of alcohol when two or more teen passengers were present.

The increased crash risk for teenagers with passengers is due, only in part, to the higher likelihood that they are at fault when with passengers. It is also because older drivers are less likely to be at fault when with passengers. The reason for why older drivers are less often at fault with passengers than when driving alone is not clear. It may have to do with characteristics of the people who drive alone compared with those who drive with passengers, or with the characteristics of the situation. For example, older people may be more attentive when transporting other persons, including family members, than when traveling alone, and/or passengers may assist older drivers in detecting and responding to potentially hazardous situations or in remaining focused on the driving task.

The per-mile fatal crash rate for teenage drivers is approximately three times greater after 9.00 P.M. than during the day (Williams and Preusser, 1997). Night driving is often done for recreational purposes (Williams et al., in press) and often involves teenage passengers. Thus, one way to reduce the risk caused by teenage passengers is to adopt a night-time driving curfew prohibiting all driving by young drivers after a certain time. Nine states in the United States currently have night-time driving curfews for 16-year-old and sometimes 17-year-old drivers. Night-time curfews have been shown to be an effective way to reduce the night-time crash risk (Preusser et al., 1984, 1990, 1993). However, as this study indicates, night-time curfews alone would not address the increased crash risk with teenage passengers in the daytime. Another approach would be to restrict young drivers from transporting teenage passengers, both during the day and at night. Although no such restriction has been adopted in the United States, such a restriction already exists as part of the New Zealand Graduated Licensing System and has been shown to be effective (Frith and Perkins, 1992).

There is a legitimate concern that if teenage drivers are not permitted to transport other teenagers, it could lead to more teenage drivers on the road. Unlicensed teenagers who rely on rides with their peers may become licensed sooner than they otherwise would, and those with licenses who cannot travel with their peers may drive instead. This would offset some of the benefits of the passenger restrictions, but it is likely that some of those restricted from traveling with teenage drivers would not make the trip by car at all, or would be driven by their parents or other adults. Some parents also may be concerned, particularly in the case of their teenage daughters, about their security when driving alone. The present study cannot address the question of whether or not teenagers would still make the trips if they could not travel with their friends, nor can it address security issues. Nevertheless, it is felt that the risk ratios for teenagers with multiple passengers are sufficiently compelling to warrant further research to determine ways in which these risks can be reduced or eliminated.

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